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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/602,194	06/23/2003	Yoshi Ono	SLA 0669	9996

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EXAMINER	
NGUYEN, KHIEM D	
ART UNIT	**PAPER NUMBER**
2823	

DATE MAILED: 08/05/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/602,194	ONO, YOSHI	
	Examiner	Art Unit	
	Khiem D. Nguyen	2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 May 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-5,7-11 and 13-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,7-11 and 13-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *23 June 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

The non-final rejection as set forth in paper No. (030905) mailed on March 15th, 2005 is withdrawn in response to Applicants' amendments. A new rejection is made as set forth in this Office Action. Claims (1-5, 7-11 and 13-21) are pending in the application.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

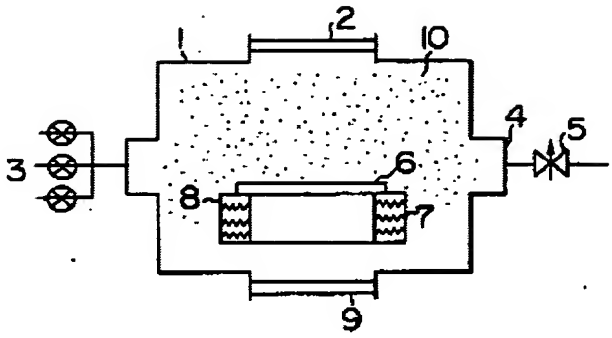
(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-5, 7-11 and 13-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Azuma et al. (U.S. Patent 4,495,218).

In re claim 1, **Azuma** discloses a method of low-temperature nitridation of a silicon substrate comprising:

placing a silicon wafer **6** in a vacuum chamber **1** on a heated chuck **7**;

maintaining the silicon wafer **6** at a temperature of between about 20 to 400 °C (col. 2, lines 30-60 and FIG. 1);



introducing a nitrogen-containing gas into the vacuum chamber **1**, wherein the nitrogen-containing gas is taken form the group of gases consisting of NH_3 (col. 3, lines 11-13);

dissociating the nitrogen-containing gas into nitrogen with a xenon excimer lamp, and flowing the nitrogen over the silicon wafer **6** (col. 2, lines 40-45). Note that the xenon excimer lamp as taught by Azuma inherently operating at a wavelength of 172 nm to flow the nitrogen over the silicon wafer **6**; and

forming an silicon nitride layer on at least a portion of the silicon wafer **6**, wherein the silicon nitride layer is formed from silicon in the silicon wafer and nitrogen from the dissociated nitrogen-containing gas (col. 3, lines 11-39 and col. 4, lines 24-33).

Azuma teaches that the silicon nitride layer was formed at a film forming rate of about 150 Angstroms/min but does not explicitly disclose that the silicon nitride layer so formed has a thickness of less than 5 nm as recited in the independent claim 1.

However, there is no evidence indicating the thickness of the silicon nitride layer is critical and it has been held that it is not inventive to discover the optimum or workable range of a result-effective variable within given prior art conditions by routine

experimentation. See MPEP § 2144.05. Note that the specification contains no disclosure of either the critical nature of the claimed dimensions of any unexpected results arising there from. Where patentability is aid to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

In re claim 2, **Azuma** discloses that the method of claim **1** which further includes maintaining the vacuum chamber at a pressure of between about 0.1 to 100 Torr (col. 2, lines 52-56).

In re claim 3, **Azuma** discloses introducing the nitrogen containing gas in the vacuum chamber includes providing a gas flow rate of 20-30 Angstroms/min (col. 3, lines 17-30).

In re claim 4, **Azuma** does not explicitly teach maintaining the wafer in the vacuum chamber in contact with nitrogen for between about thirty seconds and three hours.

However, there is no evidence indicating the time duration that the wafer in contact with nitrogen is critical and it has been held that it is not inventive to discover the optimum or workable time duration of a result-effective variable within given prior art conditions by routine experimentation.

In re claim 5, **Azuma** does not explicitly teach forming a silicon nitride layer on a silicon wafer in a time period of between about thirty seconds to three hours.

However, there is no evidence indicating the time duration that the forming a silicon nitride layer on a silicon wafer is critical and it has been held that it is not inventive to discover the optimum or workable time duration of a result-effective variable within given prior art conditions by routine experimentation.

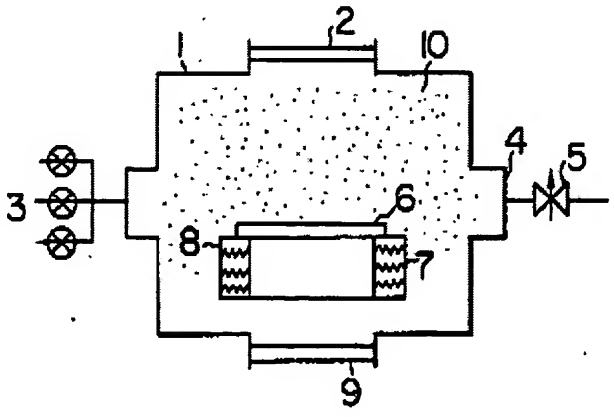
In re claim 7, **Azuma** discloses that the forming includes providing a positively charged interface across the nitride layer (col. 4, lines 6-21).

In re claim 8, **Azuma** discloses that placing includes placing a silicon wafer **6** having a layer of silicon oxide on the upper surface thereof in a vacuum chamber (FIG. 1 and related text).

In re claim 9, **Azuma** discloses a method of low-temperature nitridation of a silicon substrate comprising:

placing a silicon wafer **6** in a vacuum chamber **1** on a heated chuck **7**;

maintaining the silicon wafer **6** at a temperature of between about 20 to 400 °C and at a pressure of about 0.1 to 100 Torr (col. 2, lines 30-60 and FIG. 1);



introducing a nitrogen-containing gas into the vacuum chamber **1**, wherein the nitrogen-containing gas is taken form the group of gases consisting of NH_3 (col. 3, lines 11-13);

dissociating the nitrogen-containing gas into nitrogen with a xenon excimer lamp, and flowing the nitrogen over the silicon wafer 6 (col. 2, lines 40-45). Note that the xenon excimer lamp as taught by Azuma inherently operating at a wavelength of 172 nm to flow the nitrogen over the silicon wafer 6; and

forming an silicon nitride layer on at least a portion of the silicon wafer **6**, wherein the silicon nitride layer is formed from silicon in the silicon wafer and nitrogen from the dissociated nitrogen-containing gas (col. 3, lines 11-39 and col. 4, lines 24-33).

Azuma teaches that the silicon nitride layer was formed at a film forming rate of about 150 Angstroms/min but does not explicitly disclose that the silicon nitride layer so formed has a thickness of less than 5 nm as recited in the independent claim 9.

However, there is no evidence indicating the thickness of the silicon nitride layer is critical and it has been held that it is not inventive to discover the optimum or workable range of a result-effective variable within given prior art conditions by routine experimentation. See MPEP § 2144.05. Note that the specification contains no disclosure of either the critical nature of the claimed dimensions of any unexpected results arising there from. Where patentability is aid to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

In re claim 10, **Azuma** does not explicitly teach forming a silicon nitride layer on a silicon wafer in a time period of between about thirty seconds to three hours.

However, there is no evidence indicating the time duration that the forming a silicon nitride layer on a silicon wafer is critical and it has been held that it is not inventive to discover the optimum or workable time duration of a result-effective variable within given prior art conditions by routine experimentation.

In re claim 11, **Azuma** does not explicitly teach maintaining the wafer in the vacuum chamber in contact with nitrogen for between about thirty seconds and three hours.

However, there is no evidence indicating the time duration that the wafer in contact with nitrogen is critical and it has been held that it is not inventive to discover the optimum or workable time duration of a result-effective variable within given prior art conditions by routine experimentation.

In re claim 13, **Azuma** discloses introducing the nitrogen containing gas in the vacuum chamber includes providing a gas flow rate of 20-30 Angstroms/min (col. 3, lines 17-30).

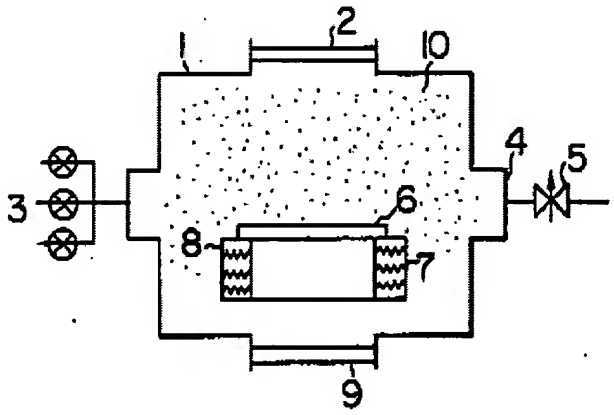
In re claim 14, **Azuma** discloses that the forming includes providing a positively charged interface across the nitride layer (col. 4, lines 6-21).

In re claim 15, **Azuma** discloses that placing includes placing a silicon wafer **6** having a layer of silicon oxide on the upper surface thereof in a vacuum chamber (FIG. 1 and related text).

In re claim 16, **Azuma** discloses a method of low-temperature nitridation of a silicon substrate comprising:

placing a silicon wafer **6** in a vacuum chamber **1** on a heated chuck **7**;

maintaining the silicon wafer **6** at a temperature of between about 20 to 400 °C (col. 2, lines 30-60 and FIG. 1);



providing a positively charged interface across the nitride layer (col. 4, lines 6-21)

introducing a nitrogen-containing gas into the vacuum chamber **1**, wherein the nitrogen-containing gas is taken form the group of gases consisting of NH_3 (col. 3, lines 11-13);

dissociating the nitrogen-containing gas into nitrogen with a xenon excimer lamp, and flowing the nitrogen over the silicon wafer 6 (col. 2, lines 40-45). Note that the xenon excimer lamp as taught by Azuma inherently operating at a wavelength of 172 nm to flow the nitrogen over the silicon wafer 6; and

forming an silicon nitride layer on at least a portion of the silicon wafer **6**, wherein the silicon nitride layer is formed from silicon in the silicon wafer and nitrogen from the dissociated nitrogen-containing gas (col. 3, lines 11-39 and col. 4, lines 24-33).

Azuma teaches that the silicon nitride layer was formed at a film forming rate of about 150 Angstroms/min but does not explicitly disclose that the silicon nitride layer so formed has a thickness of less than 5 nm as recited in the independent claim 16.

However, there is no evidence indicating the thickness of the silicon nitride layer is critical and it has been held that it is not inventive to discover the optimum or workable range of a result-effective variable within given prior art conditions by routine experimentation. See MPEP § 2144.05. Note that the specification contains no disclosure of either the critical nature of the claimed dimensions of any unexpected results arising there from. Where patentability is aid to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

In re claim 17, **Azuma** discloses that the nitrogen-containing gas is taken from the group of gases consisting of NH_3 (col. 3, lines 11-13).

In re claim 18, **Azuma** discloses that the method of claim 16 which further includes maintaining the vacuum chamber at a pressure of between about 0.1 to 100 Torr (col. 2, lines 52-56).

In re claim 19, **Azuma** does not explicitly teach forming a silicon nitride layer on a silicon wafer in a time period of between about thirty seconds to three hours.

However, there is no evidence indicating the time duration that the forming a silicon nitride layer on a silicon wafer is critical and it has been held that it is not inventive to discover the optimum or workable time duration of a result-effective variable within given prior art conditions by routine experimentation.

In re claim 20, **Azuma** does not explicitly teach maintaining the wafer in the vacuum chamber in contact with nitrogen for between about thirty seconds and three hours.

However, there is no evidence indicating the time duration that the wafer in contact with nitrogen is critical and it has been held that it is not inventive to discover the optimum or workable time duration of a result-effective variable within given prior art conditions by routine experimentation.

In re claim 21, **Azuma** discloses introducing the nitrogen containing gas in the vacuum chamber includes providing a gas flow rate of 20-30 Angstroms/min (col. 3, lines 17-30).

Response to Applicant's Amendment and Arguments

Applicant contends that Chun et al. do not form a silicon nitride layer using silicon from the wafer, nor do Chun et al. dissociate a nitrogen containing gas with photo energy from a xenon excimer lamp operating at a wavelength of 172 nm.

In response to Applicant's contention that Chun et al. do not form a silicon nitride layer using silicon from the wafer, nor do Chun et al. dissociate a nitrogen containing gas with photo energy from a xenon excimer lamp operating at a wavelength of 172 nm.

Examiner respectfully submits that Applicant's argument is moot in view of the newly discovered reference to Azuma et al. (U.S. Patent 4,495,218). Applicant is directed to the new rejection is made as set forth in this Office Action.

For this reason, Examiner holds the rejection proper.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khiem D. Nguyen whose telephone number is (571) 272-1865. The examiner can normally be reached on Monday-Friday (8:30 AM - 5:30 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew S. Smith can be reached on (571) 272-1907. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

K.N.
August 2nd, 2005

W. DAVID COLEMAN
PRIMARY EXAMINER